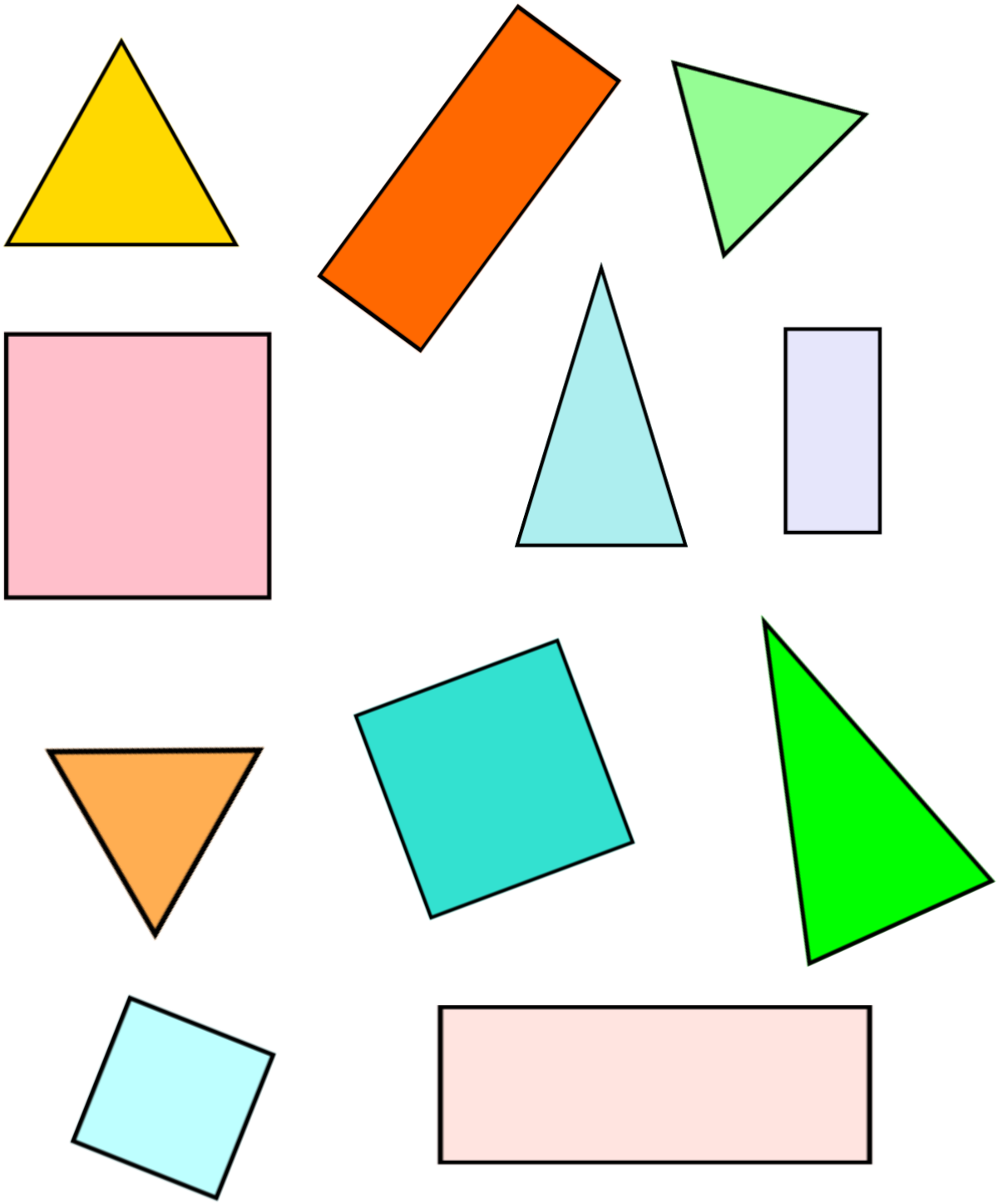
Can you sort these shapes into different categories?



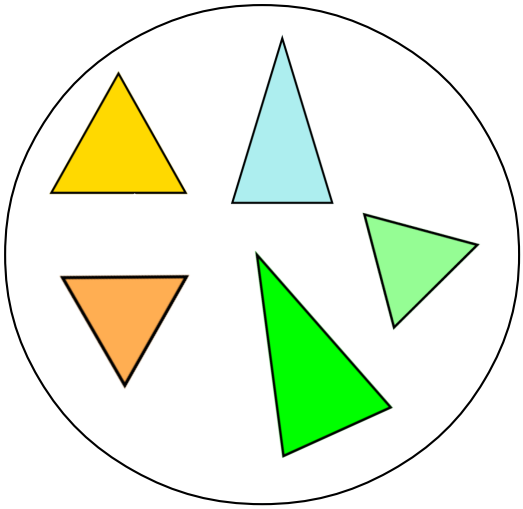
1 Can you think of different ways in which you might do this?

Classifying shapes

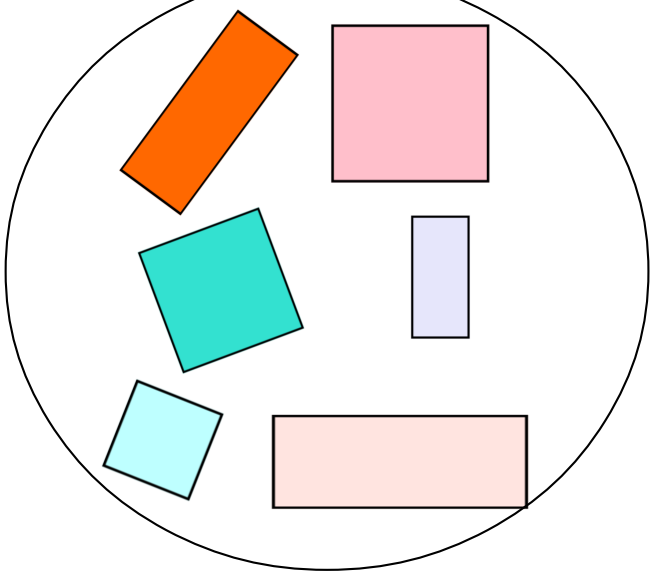


Alice

Category 1



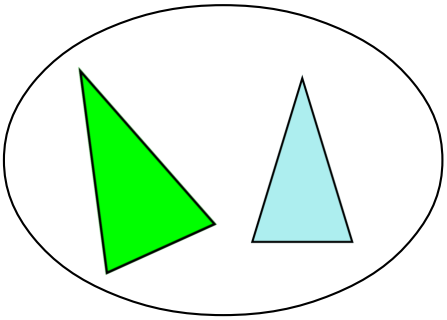
Category 2



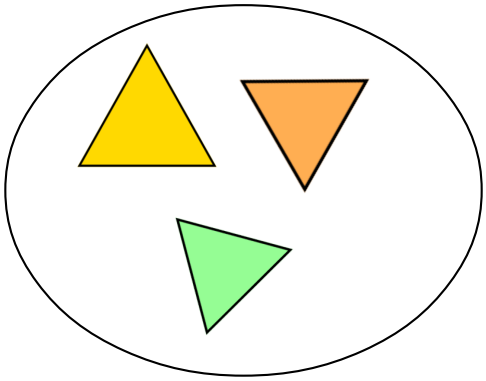


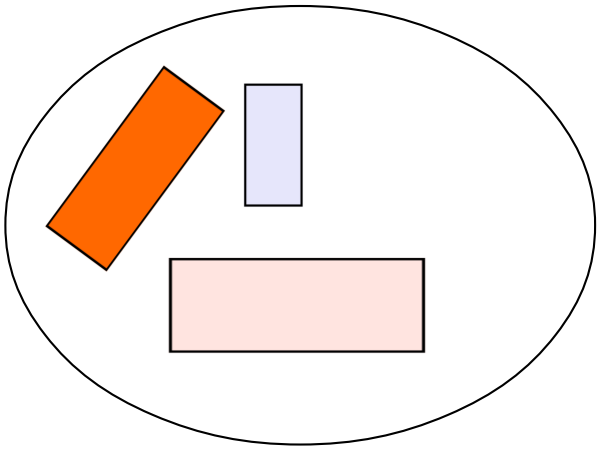
Jon

Category 1

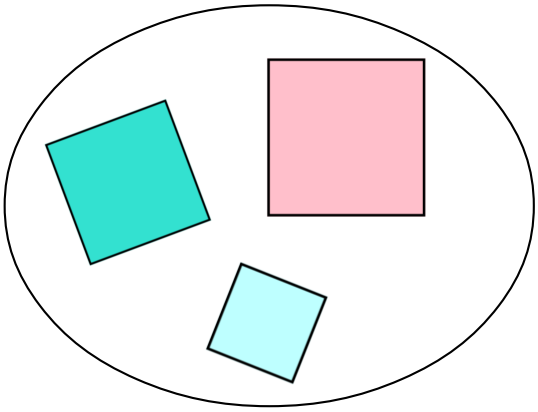


Category 2





Category 3

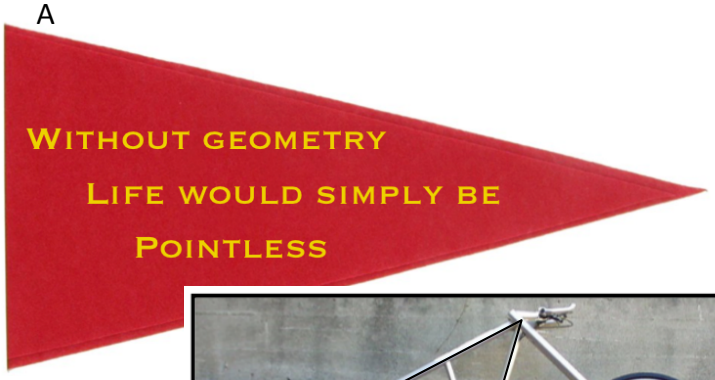


Category 4

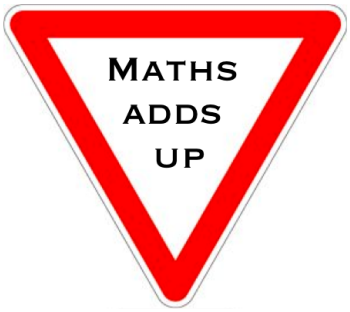
2 Can you explain Alice's thinking? What did Jon do differently?

Look at these four pictures. Each one contains a triangle.

A



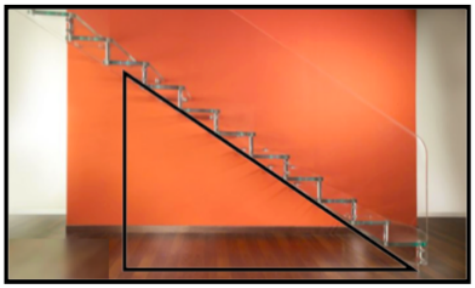
B



C



D



3 Can you explain what is the same and what is different in these four triangles?

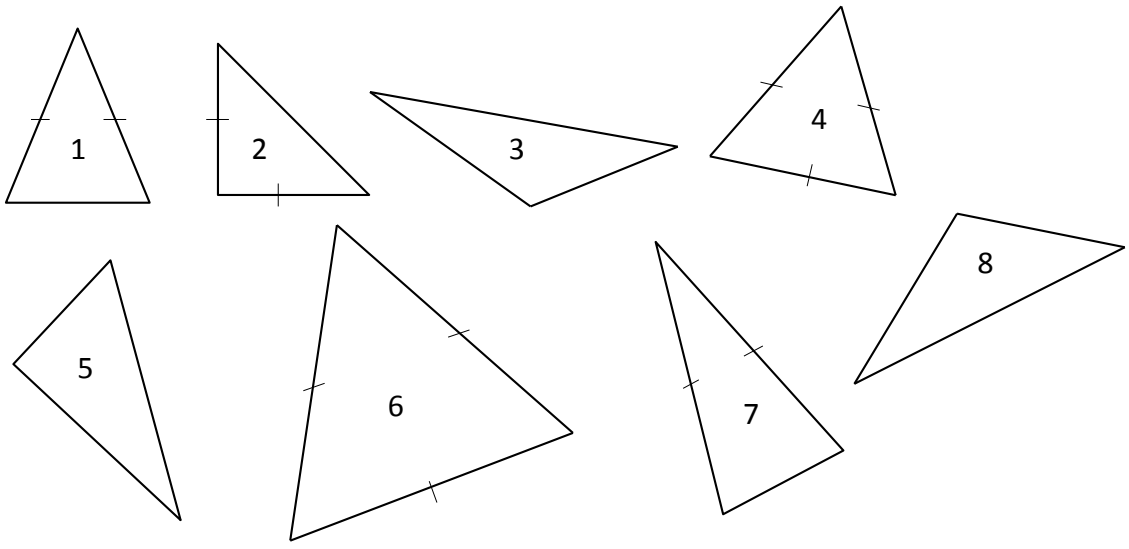
Sarah's explanation



Sarah

The triangle in A is isosceles as it has two equal sides.
The triangle in B is equilateral as it has three equal sides.
The triangle in C is scalene as all the sides are different.
The triangle in D is a right-angled triangle as one of the angles is a right angle.

4 Classify these triangles using Sarah's explanation.

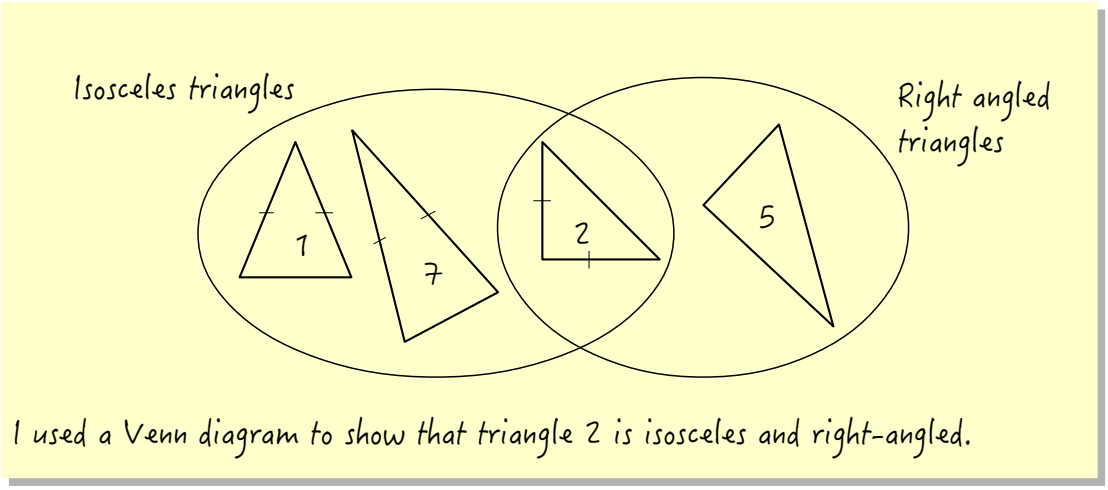


5 Is it possible for an isosceles triangle to also be a right-angled triangle?

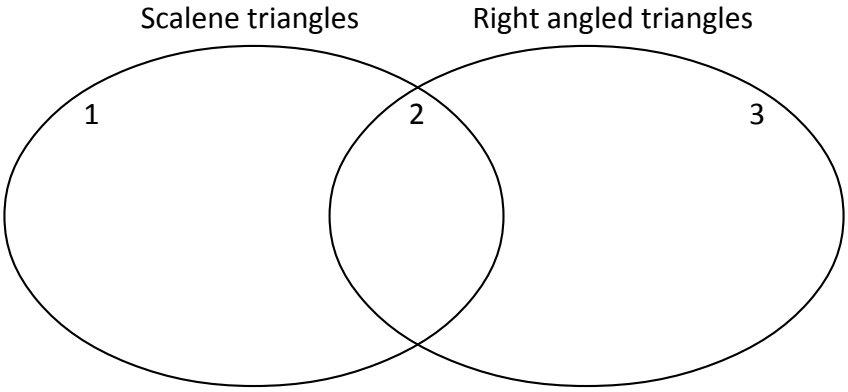


Alice

Alice's solution



6 Using Alice's idea, draw a Venn diagram using this outline. Copy this diagram. Draw two different triangles in each of the three regions.



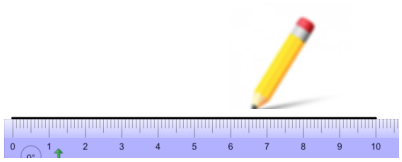
Constructing triangles

In this section, you will be asked to accurately construct various triangles based on the information given. You can only use a pencil, ruler and compass. It would be ebst if you always leave your constructions in the final diagram.

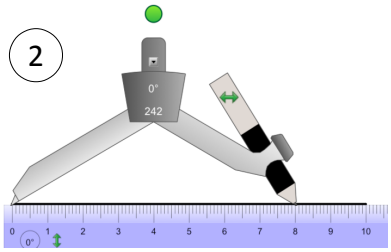
7 Using only a pencil, ruler and compass, construct a triangle with side lengths 6 cm, 8 cm and 10 cm.

8 Using only a pencil, ruler and compass, construct a triangle with side lengths 6 cm, 8 cm and 10 cm.

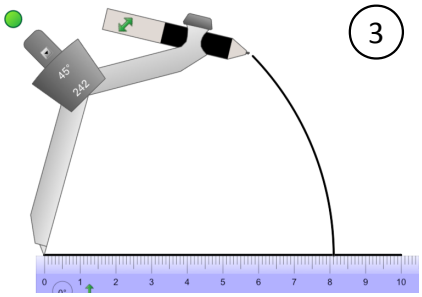
1



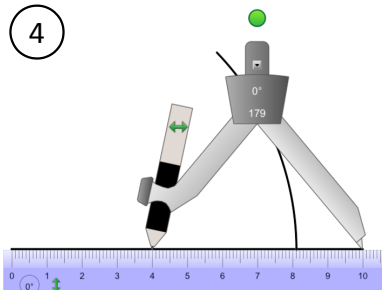
2



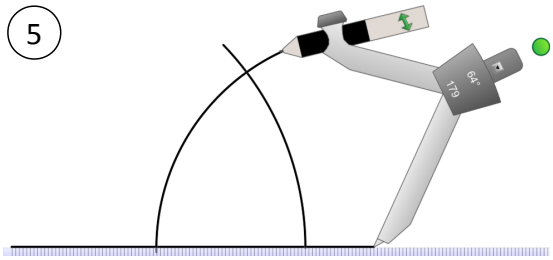
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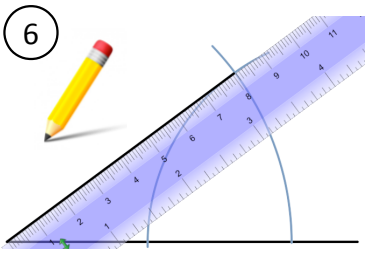
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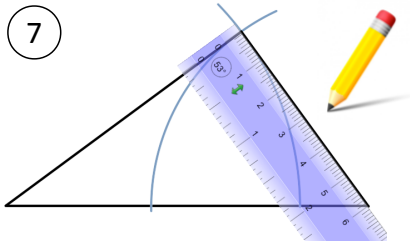
5



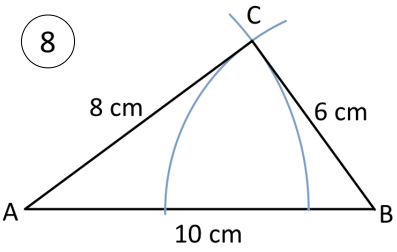
6



7



8



9 Look carefully at your final diagram. How would you classify this triangle?

Fitness check

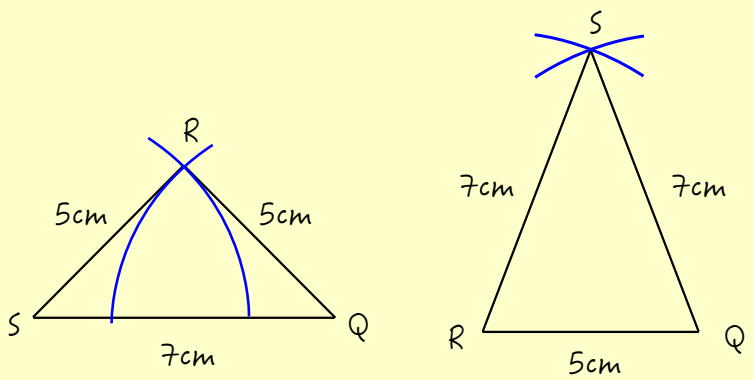
Construct these triangles using a pencil, ruler and compass.
In each case, classify the triangle formed by considering its properties.

1. Construct triangle EFG given that EF = 7 cm, EG = 7 cm and FG = 10 cm.
2. Construct an equilateral triangle HIJ given HJ = 8 cm.
3. Construct a triangle KLM given that KL = 6cm, LM = 12 cm and KM = 10 cm.
4. Construct a triangle NOP given that NP = 5cm, NO = 12 cm and OP = 13 cm.
5. Construct an isosceles triangle QRS given that QR = 5 cm and QS = 7 cm.
   Can you explain why there could be more than one solution?
6. Construct a triangle TUV given TU = 4 cm, TV = 6 cm and UV = 12 cm.
   Can you explain why this is impossible?



Matthew

Matthew's explanation for Q5.

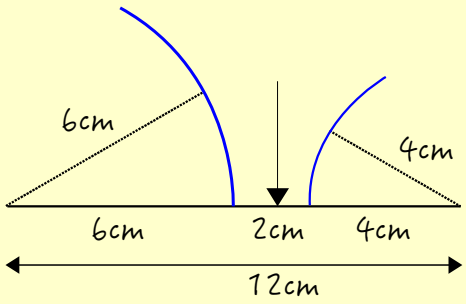


As you have only been given two sides, either could be duplicated to make an isosceles triangle.



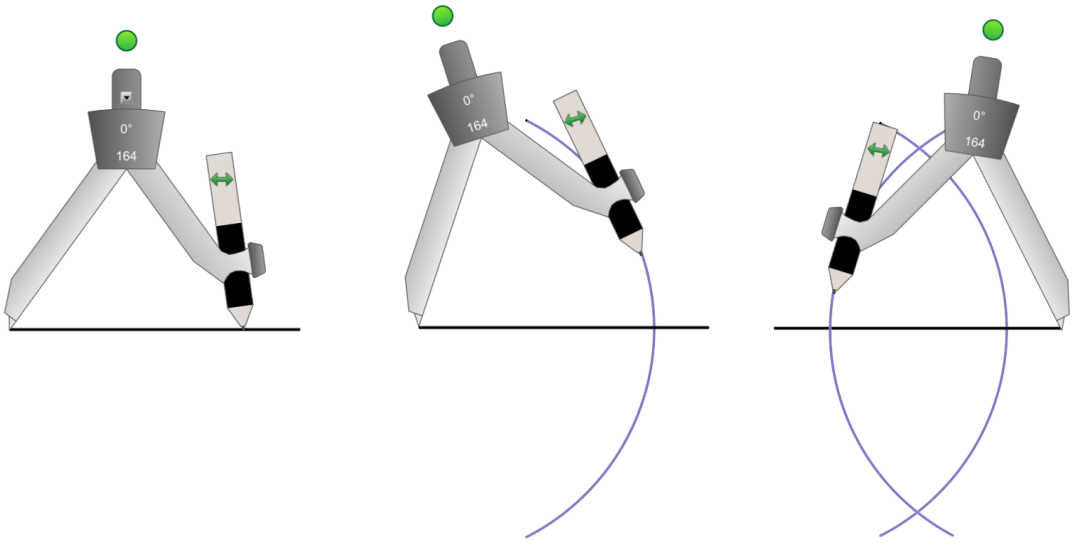
Alice

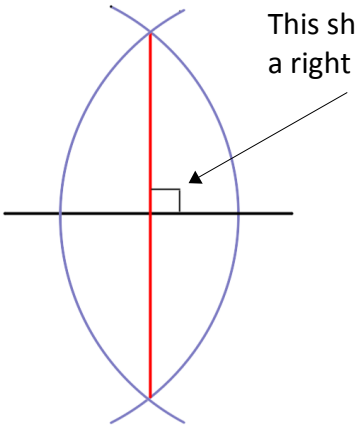
Alice's explanation for Q6.



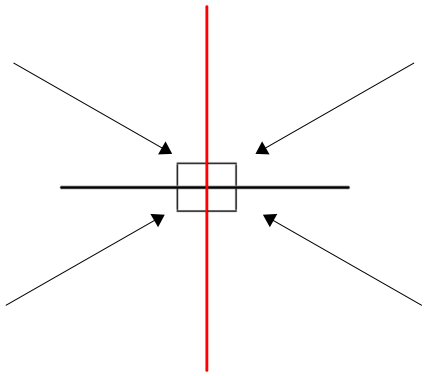
You can't draw the triangle because 4 + 6 < 12. There is a 2 cm gap in the middle.

Constructing a right angle



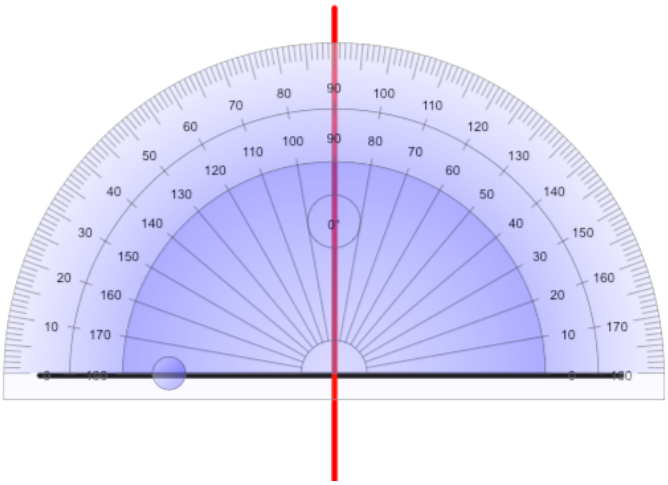


This shows it is a right angle

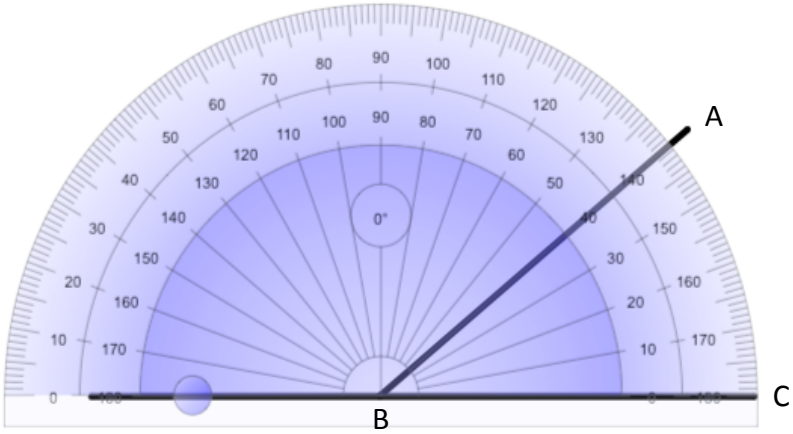


But by symmetry this actually creates 4 right angles.

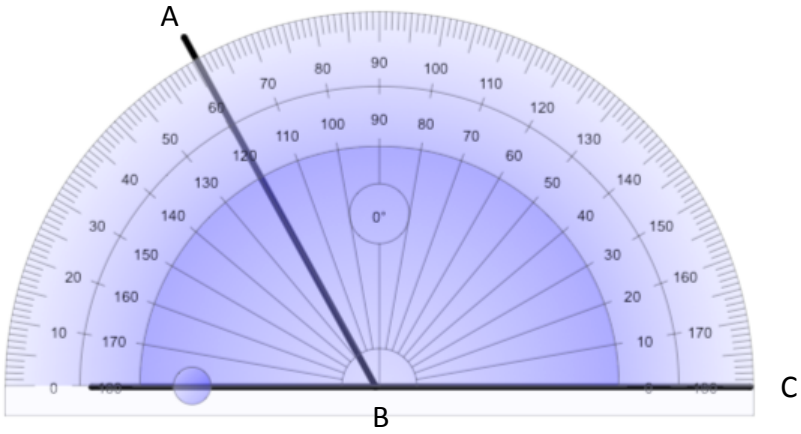
Measuring angles



We measure angles using a protractor. It is often semi-circular and is divided into 180 equal divisions known as degrees (°).
A right-angle measures 90°.
A straight angle measures 180°.



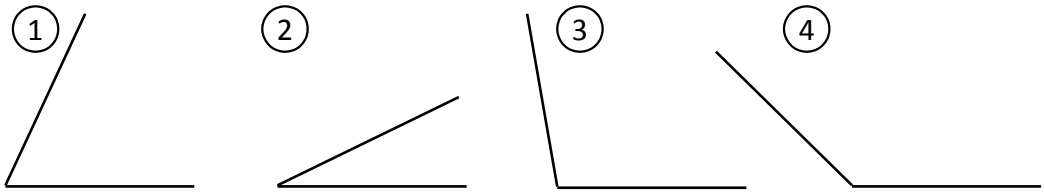
To measure the angle ABC, we place the centre of the protractor at the vertex of the angle (B) to be measured with one side of the angle (BC) passing through the zero degrees (0°) mark. The size of the angle is read from the scale where the other side (AB) meets the inner circular scale.
We write ∠ABC = 40°.
Angles less than 90° are called **acute angles**.

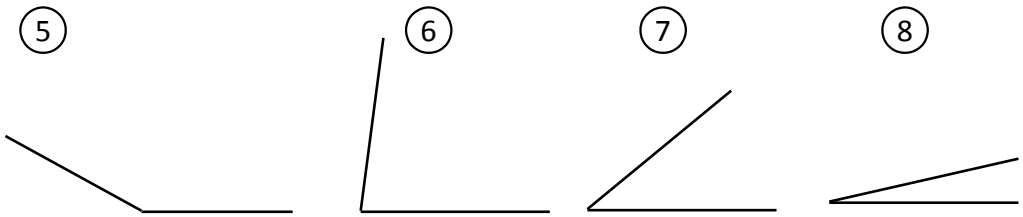


In this case, line AB meets the inner scale at 120°.
We write ∠ABC = 120°.
Angles greater than 90° but less than 180° are called **obtuse angles**.

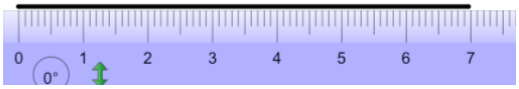
Fitness check

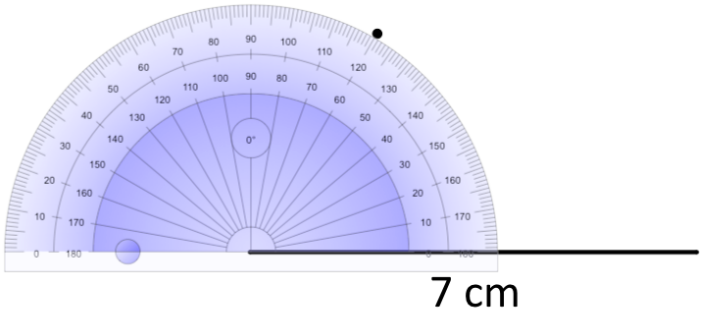
For each of these angles state whether they are acute or obtuse. Estimate the size of the angle, and then check your estimate by measuring it with a protractor.

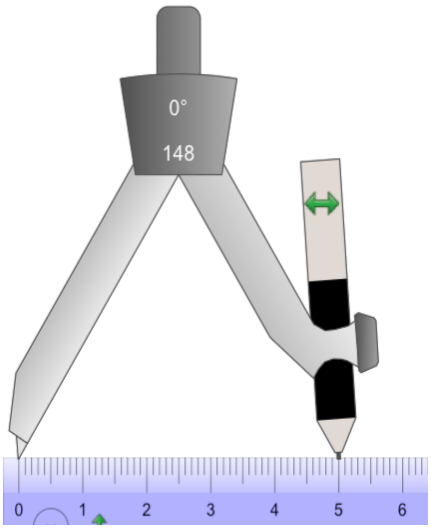


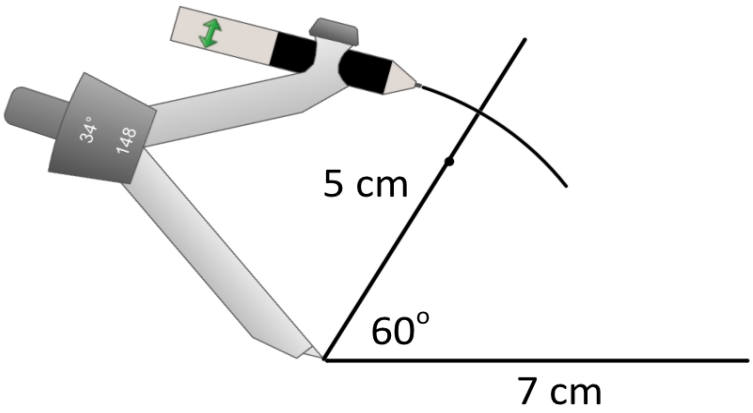


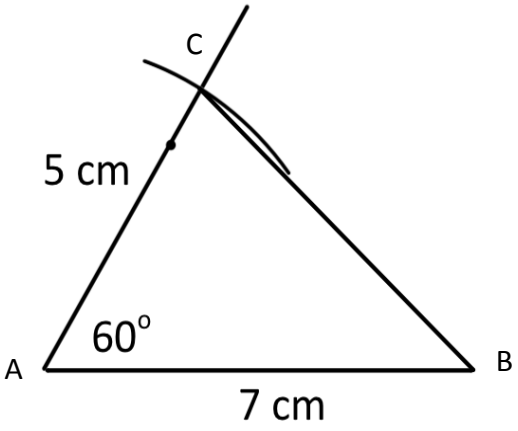
10 Construct a triangle with one side length 5 cm, another 7 cm with the angle between equal to 60°.











11 Measure ∠ABC and ∠BCA. What do you notice about the sum of the three angles within the triangle?



Alice

All three angles inside the triangle add up to ...

Fitness check

Construct these triangles.

In each case, measure the unknown side lengths and angles.

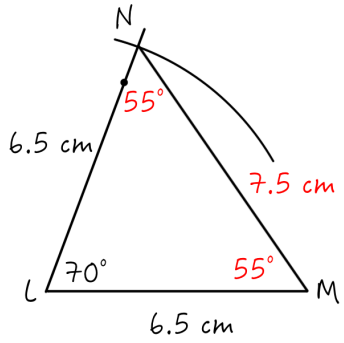
1. Construct triangle ABC where AB = 6.5 cm, BC = 8.5 and ∠ABC = 45°
2. Construct triangle DEF where DE = 7 cm, DF= 7 cm and ∠ABC = 110°
3. Construct an isosceles triangle LMN where LM = LN = 6.5 cm and one of the angles is 70°.

12 Is there more than one possible triangle in Q3? Explain your thinking.

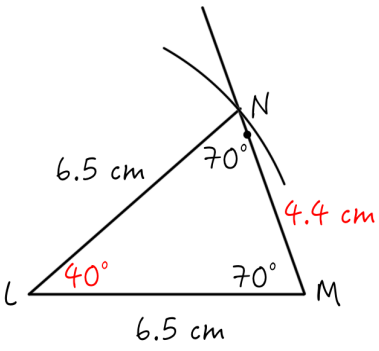


Matthew

Matthew's answer to Q3.



Sarah's answer to Q3.





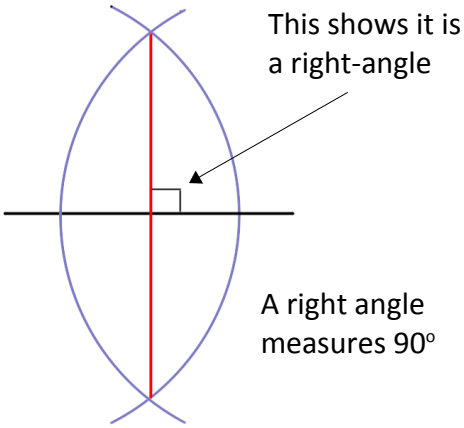
Sarah

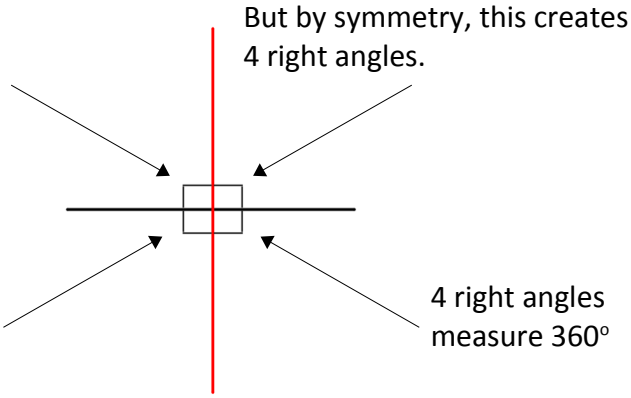
4. Construct two isosceles triangles PQR where QR= PQ = 8 cm and one of the angles is 50°.

13 In each case, check that your angles add up to 180°.

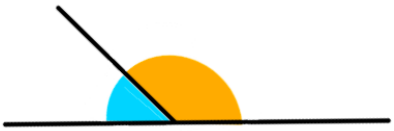
Angle facts

Some important angle facts





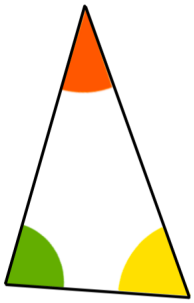
Angles on a straight line add up to 180°



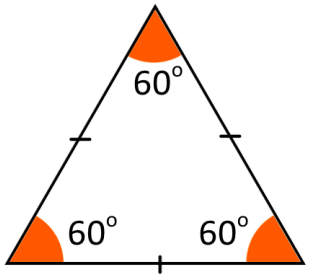
Angles at a point add up to 360°



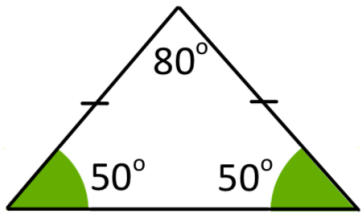
Angles in a triangle add up to 180°



An equilateral triangle has three equal sides and three equal angles

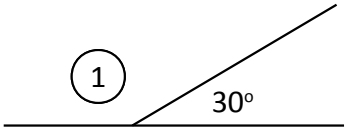


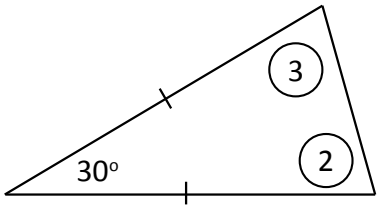
An isosceles triangle has two equal sides and a pair of equal angles.

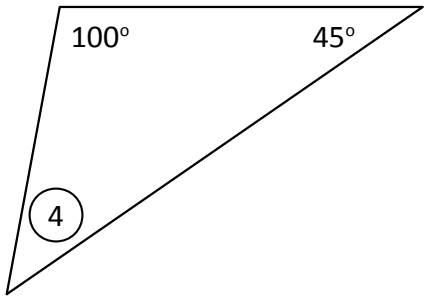


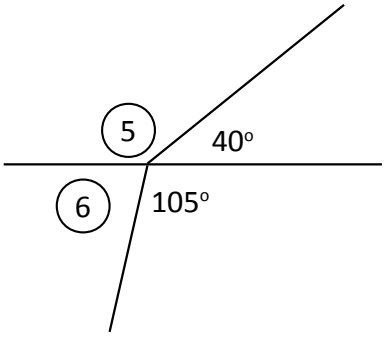
Calculating angles

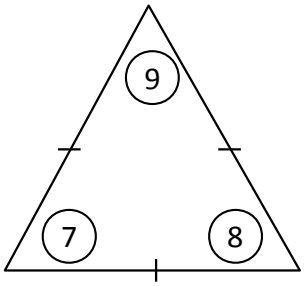
Using the angle facts from the previous page, calculate the missing angles in these triangles.

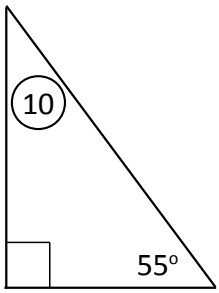


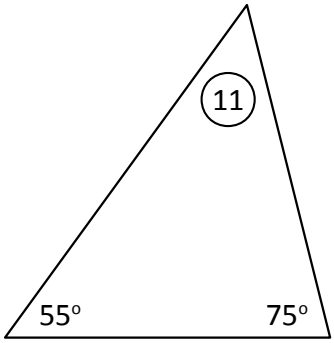


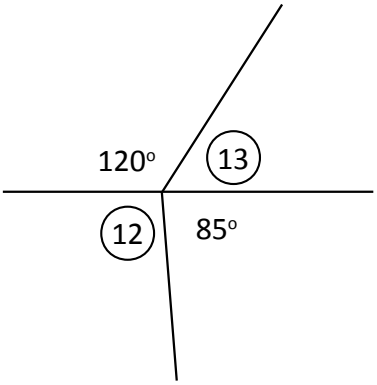


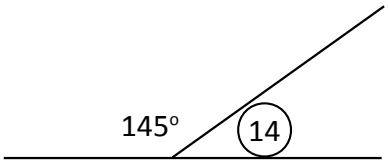


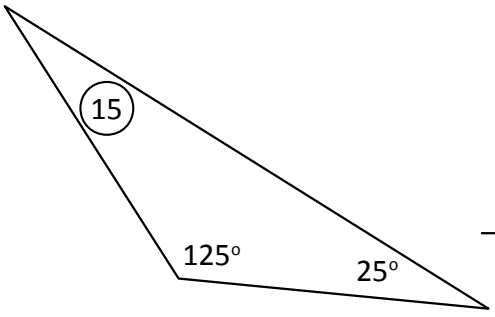


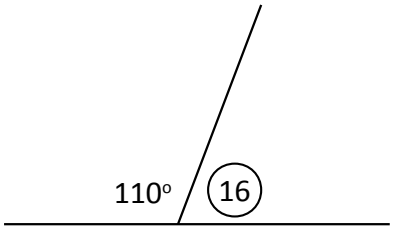


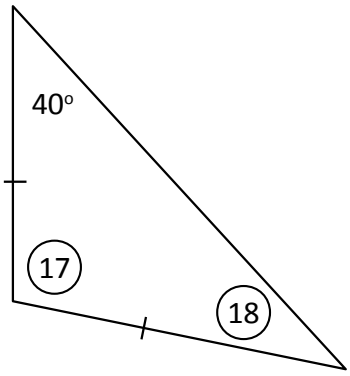




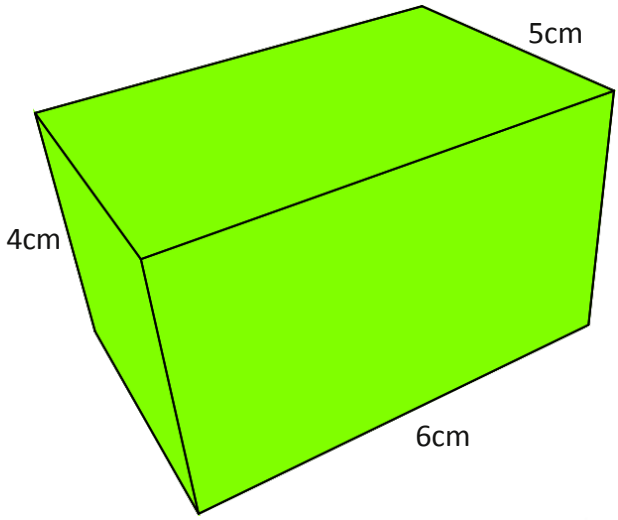








Describe the shape of the box below in words...





Evie

There are ...

☐ 4cm sides?

☐ 5cm sides?

☐ 6cm sides?



Amber

The number of vertices is ☐



Matthew

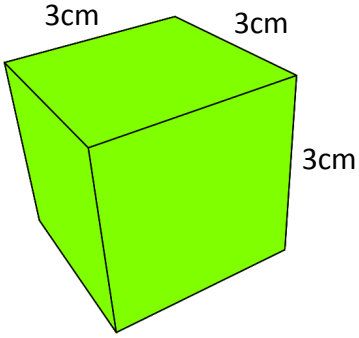
The number of the faces is ☐



Sarah

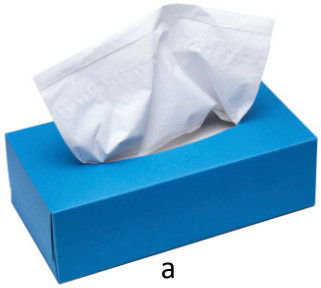
The shapes of the faces are ☐

14 How would you describe the shape of the box below?



Investigate the shape of boxes...

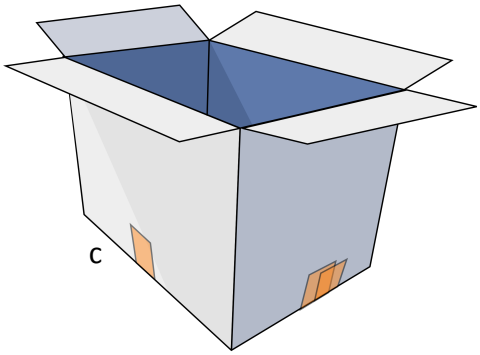
We found some boxes from around our home...



a



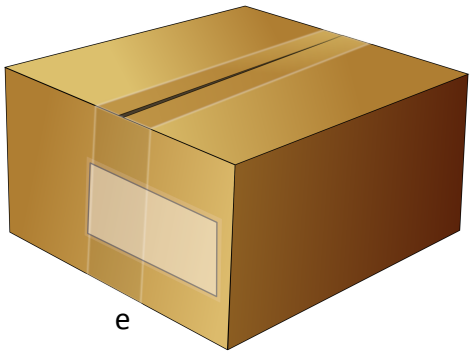
b



c



d



e



f

15 Sort the shapes of boxes above into two groups by focusing on the shapes of their faces



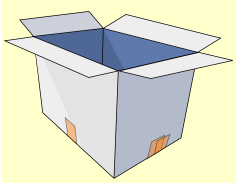
Alice

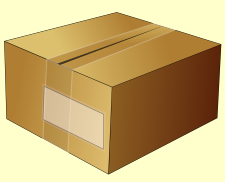
Alice's idea

Group 1









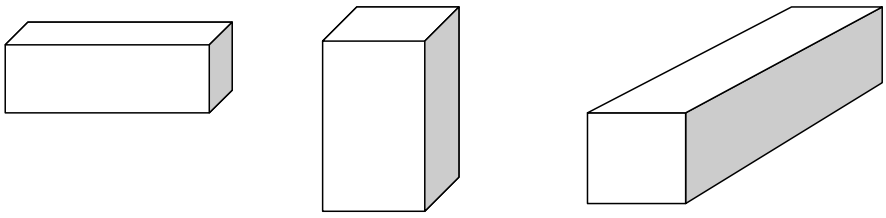
Group 2



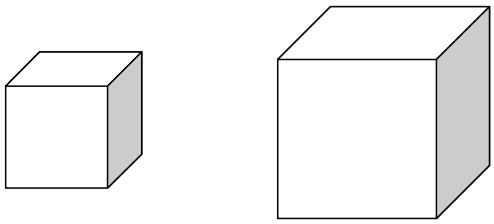


Cuboids

Solid figures that are made of only rectangles, including squares, are called **cuboids**.

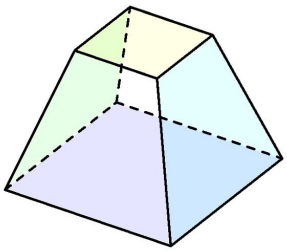


Solid figures that are made of only squares are called **cubes**.



Cubes and cuboids have six flat faces. A flat face is also called a **plane**.

16 Can you explain why this shape is not a cuboid?

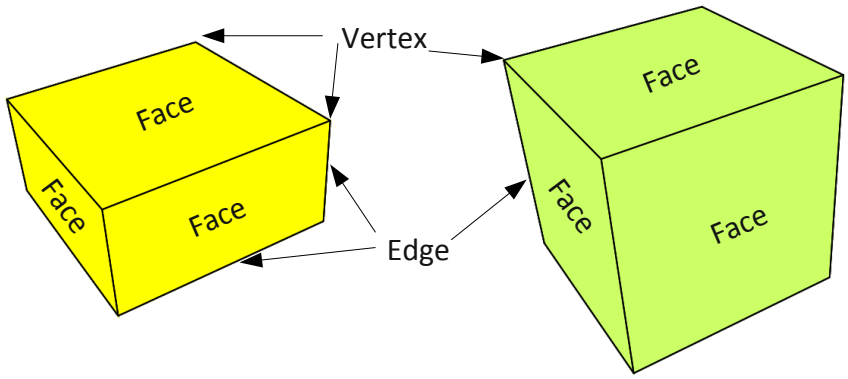


The faces are not all rectangular or squares.



Jon

Let's investigate the faces, edges and vertices of cubes and cuboids.



17 What are the similarities between cubes and cuboids?

Cuboids

1. Finding the similarities of cubes and cuboids:

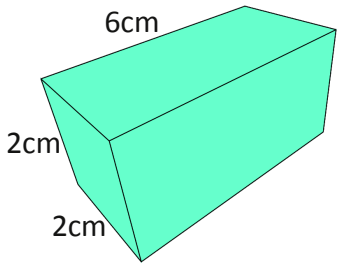
   a) Summarise the number of faces, edges, and vertices of cubes and cuboids in the table below.

	Number of faces	Number of edges	Number of vertices
Cuboids			
Cubes			

   b) In a cuboid, how many pairs of faces are exactly the same shape and size? What about in a cube?

   c) In a cuboid, how many sets of edges of equal length are there? What about in a cube?

2. In the cuboid below, how many different shaped faces are there? How many faces are there of each shape?





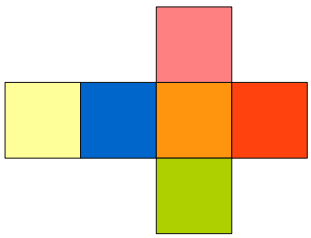
Evie

There are ☐ squares with 2cm sides and...

Making cubes and cuboids

We can easily build a model of a cuboid or cube if we have a net of the shape.
A net is what a 3D shape would look like if it were opened out flat.

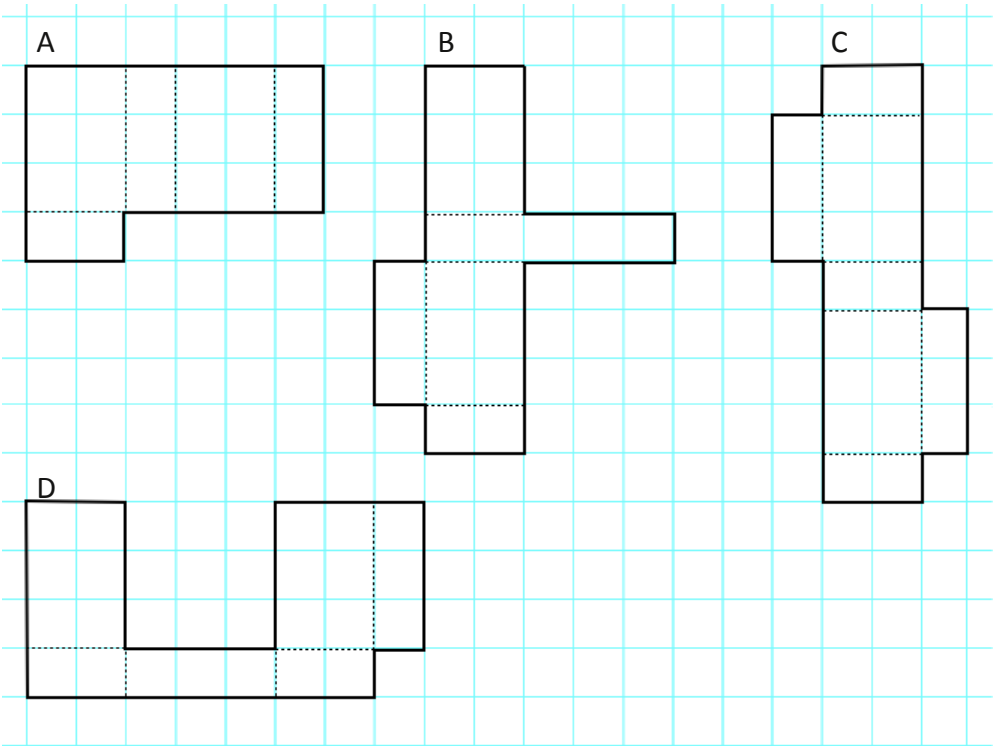
For example, this is the net of a multicoloured cube.



If we folded the net up to make a cube ...

1. which face would be opposite the (a) yellow face? (b) the blue face?
2. which faces would the pink face share with an edge?

1. Which of the following are the nets of cuboids?

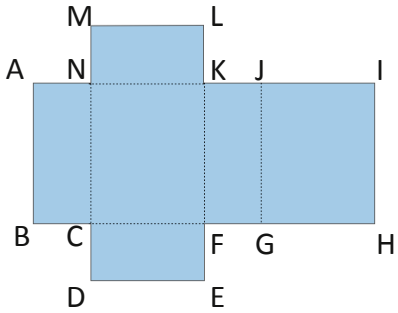


2. We are going to make a cuboid by folding the following net on the right.

   a) Which points will match up with point L?

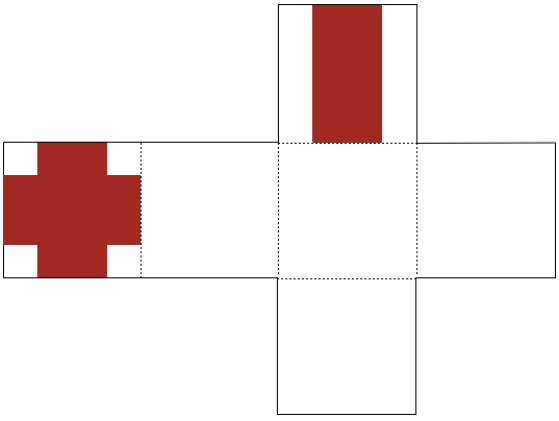
   b) Which points will match up with point A?

   c) Which edge will match up with edge GH?



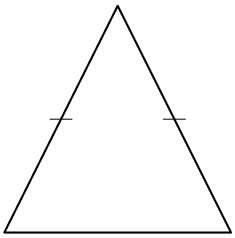
3. Suppose we wrap a ribbon around a cube, as shown below. Draw the ribbon on the net on the right so that when it is folded to form a cube, the ribbon will be wrapped around like the cube as shown.





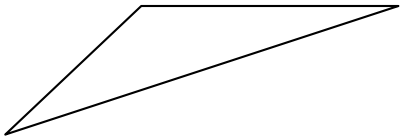
Geometry 1a: Mastery questions

1. What sort of triangle is this?



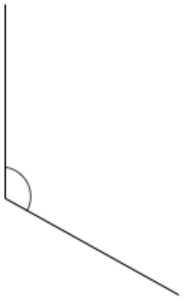
A	Equilateral
B	Right angled
C	Isosceles
D	Scalene

2. What sort of triangle is this?



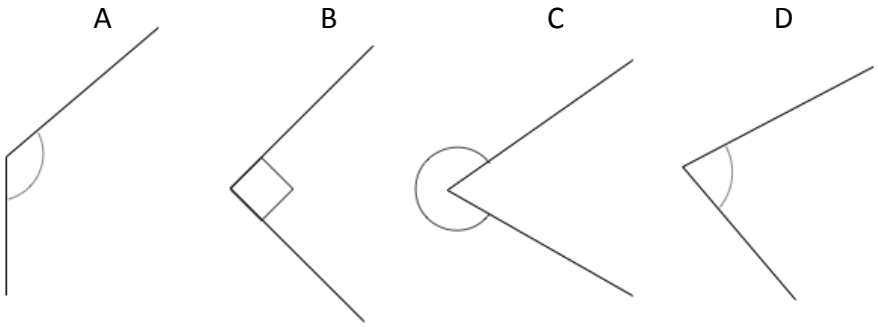
A	Equilateral
B	Right angled
C	Isosceles
D	Scalene

3. What sort of angle is this?

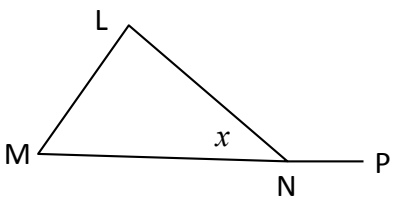


A	Reflex
B	Right angle
C	Acute
D	Obtuse

4. Which of these angles are acute?

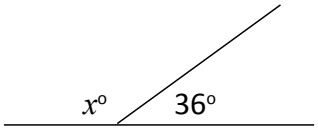


5. Which of these angles is angle x?



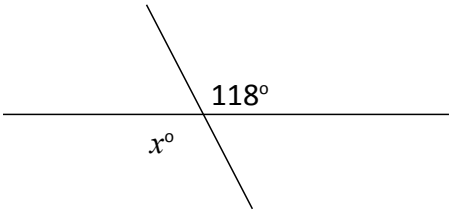
A	$\angle\pi\int\ \Omega$
B	$\angle\pi\Omega\int$
C	$\angle\pi\Omega\surd$
D	$\angle\int\ \pi\Omega$

6. What is the size of the marked angle?



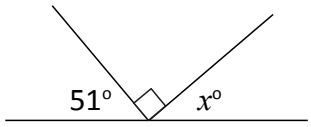
A	36°
B	54°
C	124°
D	144°

7. What is the size of the marked angle?



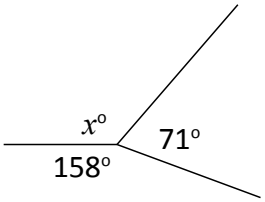
A	72°
B	118°
C	42°
D	62°

8. What is the size of the marked angle?



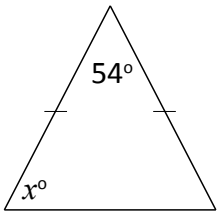
A	39°
B	118°
C	49°
D	51°

9. What is the size of the marked angle?



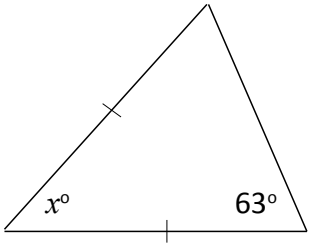
A	109°
B	22°
C	131°
D	158°

10. What is the size of the marked angle?



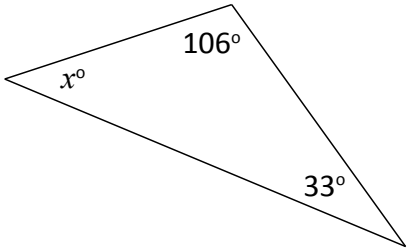
A	66°
B	63°
C	46°
D	54°

11. What is the size of the marked angle?



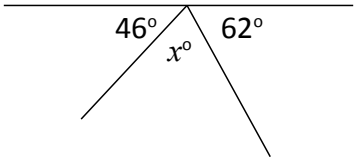
A	66°
B	63°
C	46°
D	54°

12. What is the size of the missing angle?



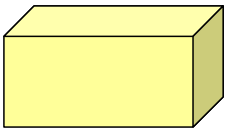
A	41°
B	33°
C	51°
D	74°

13. What is the size of the missing angle?



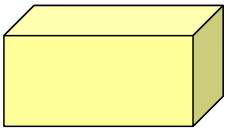
A	46°
B	44°
C	62°
D	72°

14. How many vertices does a cuboid have?



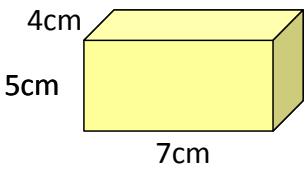
A	4	B	12	C	8	D	6

15. How many faces does a cuboid have?



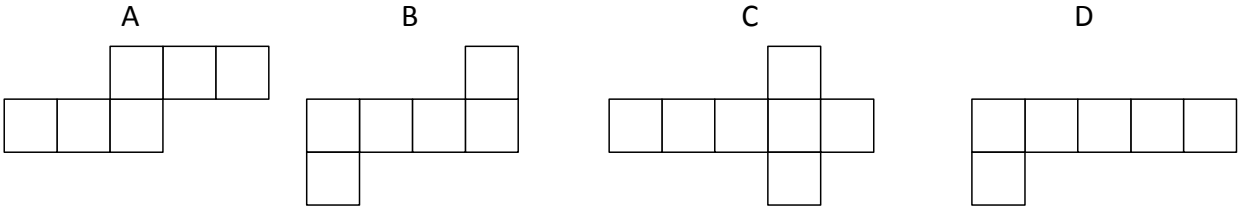
A	4	B	12	C	8	D	6

16. How many different shaped faces are there in this cuboid?

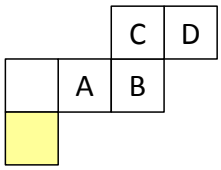


A	4	B	3	C	6	D	2

17. Which of these is not a net for a cube?



18. This is the net of a cube. When folded correctly, which face will be opposite the yellow face?



19. Which of the following sets of 3 lengths could not be used to construct a triangle?

A	6cm, 6cm, 6cm	B	6cm, 6cm, 9cm
C	6cm, 6cm, 3cm	D	6cm, 6cm, 13cm

20. Which of the following sets of 3 lengths could not be used to construct a triangle?

A	3cm, 3cm, 3cm	B	3cm, 6cm, 9cm
C	3cm, 12cm, 12cm	D	3cm, 4cm, 5cm